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on the Fertilizer Industry
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PROPOSAL FOR NEW ISSUES

Issue paper *

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INTRODUCTION

The First Consultation on the Fertilizer Industry recognized that the development of the fertilizer industry has complex ramifications and attempted to examine the main aspects of the subject ranging from infrastructure to operations and financing of fertilizer plants and to regional co-operation.

It also recognized the need to increase fertilizer consumption in the world in order to increase food production, and in particular to raise the very low levels of fertilizer consumption in developing countries. Consequently, the First Consultation suggested an objective should be the achievement by the developing countries of self-sufficiency in fertilizer production as soon as possible and in any case by 2000, at an optimum level of fertilizer consumption.

The First Consultation adopted eight recommendations of which the following four were priority issues for in-depth examination:

(a) Contract procedures to ensure the successful construction and operation of fertilizer plants, and a multilateral insurance scheme to ensure the protection of the interests of all parties concerned by providing, in particular, adequate compensation for consequential losses;

(b) Ways and means to reduce the high cost of fertilizer plants and of mobilizing the large volume of funds required for investment;

(c) Continuous monitoring of the growth of fertilizer production capacity at the national, regional and global level in order to facilitate a balanced growth of the world fertilizer industry;

(c) The opportunities for co-operation between developing countries at the sub-regional, regional and inter-regional levels, and the international support needed for that co-operation.

The remaining topics included (e) infrastructure for fertilizer plants; (f) information and data bank services on processes, equipment and project/equipment costs in the industry; (g) roster of experts to provide consultancy services to improve the operation and capacity utilization of existing and new fertilizer plants; and (h) establishing regional testing facilities for maintenance and a centre to promote the standardization of design and equipment for fertilizer plants in the developing countries.

Due to the economic importance of issue (a), entailing thousands of millions of US dollars being invested in new fertilizer plants in developing countries, UNIDO concentrated its efforts on the two subjects of this issue, namely contract procedures and multilateral insurance scheme to cover consequential losses. Work on contract procedures achieved a breakthrough in May 1981, after over 3 years of work, with the finalization of the first two UNIDO model contracts on the fertilizer industry. These model contracts could be finalized thanks to the high spirit of co-operation shown by the contractors and purchasers who participated in the corresponding discussions and negotiations. The second drafts of the remaining two model contracts are being presented to the Fourth Consultation as issue Nº1.

Concerning the multilateral insurance scheme, after over 5 years of work, no breakthrough has yet been achieved due to two main reasons. First, Governments of developed countries declined to participate in the scheme through their export credit insurance agencies; contractors indicated their unwillingness to accept liability for consequential losses; and insurers showed interest in this facility but required the fulfillment of two pre-conditions before its establishment. They are (i) current and potential markets for this type of insurance in the fertilizer and other industrial sectors for no sector alone may be sufficient to wide-spread the risks and reduce the premium, and (ii) to undertake a risk analysis of current projects in order to appraise the risk involved and the cost of the insurance premiums.

Second, a survey of 30 developing countries was launched late in 1982 in order to have a preliminary answer to the above two questions of the insurers. Of the 30 countries surveyed, 12 replies were received. Five countries indicated interest in the facility, one country indicated no interest and three countries stated not to be in position to define interest in the facility.

The Bureau of the Third Consultation was informed of this situation at its second meeting in May 1983. The Bureau recognized that this is a complex problem with no easy solution, and recommended that the Fourth Consultation be informed on the above status of the insurance scheme but without presenting this issue for discussion.

Up to mid-1981, the limited human and financial resources of UNIDO were mainly concentrated on finalizing the model contracts to achieve a practical result useful to developing and developed countries. Due to resource limitations, relatively little work could be done on the remaining issues recommended by the First Consultation except for issue (c), which is currently being carried out by the FAO/UNIDO/World Bank Working Group on Fertilizers through monitoring fertilizer capacity and supply/demand balances annually. Recommendation (e) infrastructure, was implemented through the World Bank and discussed at the Second Consultation.

From late 1981 onwards, UNIDO has concentrated its limited resources on two main areas: first, on the strengthening of economic co-operation among developing countries in the fertilizer industry, which was requested by the First Consultation and was reconfirmed and enlarged by the Second and Third Consultations. The enlarged scope of this issue currently includes recommendations (d), (f) and (g) of the First Consultation. The results achieved so far are being presented to the Fourth Consultation as issue Nº2.

Second, on the economic production of fertilizers, which was recommended by the First Consultation and was reconfirmed by the Second Consultation. However, the Third Consultation divided this topic into two issues, namely capital costs for fertilizer plants and mini fertilizer plants. The results achieved and main studies done on those two issues are being presented to the Fourth Consultation as issues Nº3 and Nº4 respectively.

During implementation activities in the past two years, participants to UNIDO expert group meetings and seminars suggested that the following new issues be dealt with by Consultations on the Fertilizer Industry: pesticides, new technologies for reducing fertilizer costs and environmental protection in relation to fertilizer plants. Further, UNIDO's technical assistance programmes are also in line with those topics. Therefore, UNIDO is presenting to the Fourth Consultation the following three new issues for its consideration:

- Issue Nº5 - Pesticides
- Issue Nº6 - New technologies for reducing fertilizer costs and increasing efficiency of fertilizer use;
- Issue Nº7 - Environmental protection for fertilizer plants.

The list of UNIDO's technical assistance projects on fertilizers and pesticides is given in the annexure as reference.

PROPOSED NEW ISSUES

ISSUE NO. 5 - PESTICIDES

Within the framework of chemical inputs for food production, two groups of products are customarily considered, fertilizers and pesticides, which together form the category of agrochemicals. Higher fertilizer consumption is needed for raising crop yields while higher pesticide application is required for preserving those yields.

Hence, pesticides as complement to fertilizers are expected to play a major role in ensuring adequate world food supply. Pesticides is a generic name for crop protection chemicals such as herbicides, insecticides, fungicides, rodenticides, etc.

The World Food Conference held in 1974 noted the high share of food loss from crops to the consumer, recognized the deficiencies in the pesticide supply system and requested UN agencies to provide technical and financial assistance to encourage developing countries to establish manufacturing units, if possible, on the basis of regional co-operation. UNIDO already has a number of technical assistance projects in pesticides.

In many developing countries loss of food on account of pests and weeds is estimated as over 30% of their grain output. Therefore, efforts are needed to increase pesticide production capacity in developing countries since financial constraints restrict their access to imported pesticides to improve their crop production.

In addition, pesticide manufacturing technology is sophisticated and fast changing, and the environmental impact of pesticide application needs close and continual study. Advantages of pesticide application have to be balanced against possible environmental damage.

Further, as pesticide-resistent species are developed after the introduction of a pesticide, there is a constant need to update pesticide technology to ensure effective crop protection.

Concerning pesticide production, a number of developing countries have or are planning to build pesticide formulation units. Some countries which already have formulation units, are planning to build plants for manufacturing basic active ingredients. Hence, plant costs and price of finished pesticides are important aspects for economic crop protection. Other important topics include toxicology, health protection of manufacturer's and user's personnel, pesticide residues in the soil and in food crops, R and D on effective and efficient use of pesticides, environmental protection for pesticide plants, registration, control and legislation in the pesticide industry, etc. Many of the above topics are complex thereby requiring co-operation with UN and other organizations. Some of the developing countries have acquired considerable expertise which they can share with other developing countries, whilst developed countries can assist in areas such as transfer of technology, R and D, etc.

Participants at the Fourth Consultation are invited:

(a) to advise UNIDO on the need to study the pesticide sector including trends in the development of synthetic and natural pesticides;

(b) to advise UNIDO on the need to identify ways and means of making effective and environmentally safe pesticides available to developing countries at reasonable prices through measures such as establishment of formulation plants with emphasis on utilization of locally available carrier materials and solvents and establishment of plants to manufacture basic active ingredients;

(c) to advise on the need to promote and strengthen the pesticide industry in developing countries through improved quality control, packaging of products and pesticide registration.

ISSUE NO. 6 - NEW TECHNOLOGIES FOR REDUCING FERTILIZER COSTS AND INCREASING THE EFFICIENCY OF FERTILIZER USE

Increases in food production large enough to meet the needs of growing populations require much higher consumption of fertilizers in developing countries. However, farmers in those countries may be unable to apply larger doses of fertilizers unless their prices are reasonable. Continuous work is therefore necessary to improve technology to reduce the production cost of fertilizers since fertilizer subsidies put a strain on government's budget.

This issue is larger than reduction in plant costs alone. It would also cover reduction of higher operating costs and developments of new low-energy technologies for fertilizer production, coating of fertilizers and other means to reduce application losses, etc.

Another area of growing importance is the use of non-metallic minerals like bentonites and perlites to improve soil fertility, reduce fertilizer losses and improve water retention in sandy soils.

Many developing countries have areas that are characterized by a predominance of arid or semi-arid agricultural soils. African countries located in the Sahelian zone are a typical example. The water retention capacity of such soils as well as their ability to absorb nutrients is very low, and even extensive irrigation and application of chemical fertilizers do not permit satisfactory crop yields. On the contrary, components of chemical fertilizers, in particular nitrogen salts, are quickly washed out of the soil into the ground water causing environmental damage.

Under these circumstances, food production remains low necessitating grain imports to feed the population whilst land reclamation is often more than offset by soil desertification in spite of costly application of water and fertilizers.

A number of non-metallic minerals have the properties required to increase the physical and chemical fertility of arid and semi-arid agricultural soils, for they retain both water and fertilizers facilitating their slow release in accordance with crop needs.

Experiments carried out in the past 15 years have shown that an application of 20 tons of a non-metallic mineral like bentonite per hectare, enhances water retention to such an extent that irrigation can be reduced to about 4,000 m^3 per hectare per crop. Further, bentonite addition, under similar conditions of irrigation and fertilization, results in a 20-35% increase in crop yield depending on the species.

The common occurrence of non-metallic minerals coupled to its direct application requiring no or only minimal preparation to increase their activity, makes economically desirable its widespread use in arid and semi-arid soils. Further, it requires physical application at 7-10 year intervals while enhancing the build-up of a higher humus content in the soil thus gradually eliminating soil losses to desertification and the need for further soil reclamation programmes.

Participants at the Fourth Consultation are invited to advise the parties concerned on the need to study new technologies for reducing fertilizer costs and increasing the efficiency of fertilizer use, in particular on the application of non-metallic minerals to agricultural soils.

ISSUE NO. 7 - ENVIRONMENTAL PROTECTION FOR FERTILIZER PLANTS

Large fertilizer plants and smaller plants set up within crop land generate substantial pollution problems, in particular in the phosphate industry.

Therefore, environmental impact evaluations should be made at the initial stages of planning a new fertilizer plant, and to identify specific pollution problems of existing fertilizer plants in order to prevent or minimize pollution.

In general, an assessment of the environmental problems caused by existing fertilizer plants include air pollution, water pollution and solid wastes disposal. In many cases, when corrective steps are taken to reduce or eliminate, for instance, gaseous effluents by scrubbing, aqueous effluents are produced with varying concentration of the contaminants. Unless practical means are available to recycle those effluents in the process stream, steps have to be taken to treat the waste waters. Similar environmental problems exist concerning the disposal of solid wastes like gypsum and other solids.

The Bureau of the Third Consultation at its second meeting in May 1983, took note of the above problems and recommended that UNIDO prepare a paper on new technological developments in developing countries, including waste and pollution technologies. This paper could not be prepared due to time and resource limitations.

Participants at the Fourth Consultation are invited:

(a) to advise UNIDO on the need to prepare a study on environmental problems caused by existing fertilizer plants in developing countries, and to appraise process modifications or new technologies to reduce wastes and pollution.

(b) to advise the parties concerned on steps to be taken on environmental support measures like monitoring to insure effective pollution control, the establishment of appropriate guidelines and standards to regulate emissions of pollutants and effluents from fertilizer plants, the need for environmental impact assessment before constructing new fertilizer plants, etc.

ANNEX

UNIDO'S TECHNICAL ASSISTANCE PROGRAMME IN THE FERTILIZER SECTOR

1. Through this programme, UNIDO seeks to assist developing countries in accelerating their industrialization process through the development and improvement of industrial sectors, enterprises and facilities. The basic objective is the promotion of self-reliance in developing countries by building their productive capability and their indigenous resources and by increasing the availability of the managerial, technical, administrative and research capabilities. Within the technical co-operation programme, special attention is given to projects involving co-operation among developing countries.

2. The major source of financing of the technical assistance programme is UNDP through the UNDP Country Programme established for each country on the basis of a five-year programme cycle. Funds of the Special Industrial Services (SIS) programme of UNDP are utilized to meet short-term, urgent and unforeseen requirements of high priority through quick provision of expert advisory services in the industrial sector. The third source of financial resources is the United Nations Industrial Development Fund (UNIDF) assigned to UNIDO for its activities including those of technical assistance programme for developing countries.

3. UNIDO's Technical Assistance Programme in the fertilizer sector has been substantial. Over the years, UNIDO has rendered assistance under this programme through 63 fertilizer projects with a combined cost of over US$ 7 millions.

4. The programme is mainly aimed at promoting, developing and strengthening fertilizer industry in developing countries. It has covered investigations for utilizing locally available fertilizer raw materials, preparation of feasibility studies, evaluation of tenders for construction of the plant, assistance in improving operations of the plant, training of operators, modernization of engineering design and consultancy services, prevention of water and air pollution, assistance in strengthening R+D facilities and examination of application of non-metallic minerals to soil, for increasing fertilizer use efficiency. The programme has also included projects for regional co-operation for fertilizer production and distribution. UNIDO has undertaken some of these projects in collaboration with FAO, ESCAP and regional organizations. UNIDO's technical assistance programme essentially has a promotional content and it does not cover financing of commercial plants. UNIDO can, however, take up the technical assistance portion of loans of World Bank and regional development banks like ADB who often finance fertilizer projects.

5. Some of the UNIDO technical assistance projects are described below. This is not an exhaustive list but only an illustrative one.

a) Upgrading of fertilizer raw materials: Studies for upgrading rock phosphate and for their utilization for phosphate fertilizers were completed in Peru. Two projects, recently taken up in India, comprise of investigations to produce sulphuric acid from low-grade pyrites and phosphate fertilizers from low-grade rock phosphate.

b) Preparation of feasibility studies: Feasibility studies have been carried out for possible fertilizer projects in a number of developing countries, e.g.

i) Argentina study was for a nitrogen plant based on utilization of natural and associated gas. The Zaire study was for ammonia and phosphate plants based on low-cost electric power and local phosphate rock respectively.

ii) Studies were carried out by UNIDO in co-operation with FAO for investment opportunities for the establishment of facilities for bulk-blending and bagging of fertilizers and for manufacturing fertilizers in 23 least developed countries in Africa, Middle East and Asia.

iii) UNIDO completed a survey for the OCAM Secretariat in Bangui, Central African Republic, representing Benin, Ivory Coast, Niger, Rwanda, Senegal, Upper Volta, Togo and Mauritius, to see where phosphate fertilizer plants could be established, utilizing indigenously available rock phosphates.

c) Assistance in improving plant operations:

i) Technical assistance was extended to Pakistan for improving capacity utilization of nitro-phosphate plant and for obtaining a product with higher water-solubility.

ii) Technical assistance was given to Bangladesh for improving the capacity utilization of urea and Triple Super phosphate plants.

d) Training:

i) With the assistance of Austrian Government, UNIDO has organized training workshop for 7-8 weeks for upgrading the skills of 12 maintenance engineers from developing countries. So far, six such workshops have been held.

ii) UNIDO, in co-operation with the Government of the USSR, has organized "In-Plant Group Training Programme" in USSR for engineers from developing countries to provide them with theoretical knowledge and concentrated practical experience in the fertilizer industry. The programme is for about 15 persons for a period of three months. Twelve such programmes have been organized so far.

e) Modernization of Engineering Design and Consultancy Services: Consultancy services were provided to Engineers India Ltd. (EIL) for modernization of design and engineering capabilities. Apart from the supply of computer and chromatograph gas analyzer, professional expert services were provided under this project.

f) R+D projects: The project for giving assistance to Syria for developing design and research capabilities is expected to commence soon. A pilot plant will be designed for testing catalysts and taking up other research work.

g) Application of non-metallic minerals: The recent research work, particularly in Czechoslovakia, has shown that non-metallic minerals such as bentonite, perlite, zeolites, etc., can play an important role in improving agricultural production in sandy soils by improving their water retention capacity and reducing "wash out" losses of chemical fertilizers. Technical assistance is being given to Egypt for soil upgrading through application of local bentonite.

h) Organic Fertilizers: In this related important area, UNIDO has been assisting developing countries in the production of compost (soil conditioner and organic fertilizer) from municipal solid wastes. The work covered feasibility studies, rehabilitation of existing compost plants, and technical advisory services for planning and establishment of compost plants. UNIDO has assisted in rehabilitating a number of compost plants in Morocco, carried out pre-feasibility and feasibility studies for compost plants in Benin, Mali, Upper Volta, People's Democratic Republic of Yemen, Sierra Leone and Syria while in Indonesia assistance has been provided in trouble-shooting at two existing compost plants. UNIDO's assistance in Syria led to the acquisition of loans by the Damascus Municipality for construction of a pilot plant. UNIDO expert is still assisting Damascus Municipality in preparation of tender invitations, pre-qualification documents and evaluation of bids. UNIDO's overall approach has been to encourage developing countries to carefully select the composting process and design the plant equipment so that the process works well in their climatic conditions and that the majority of equipment components can be fabricated locally.

6. UNIDO is also involved in a number of regional programmes. Illustrative programmes are mentioned below:

a) Fertilizer Advisory Development and Information Network for Asia and the Pacific: This network has been set up by ESCAP/FAO/UNIDO to facilitate, increase and spread the use of fertilizers in developing countries of the region and to promote increased efficiency in the production, marketing and use of fertilizers.

b) Regional Co-operation Programme for the Development and Promotion of Fertilizer Production and Utilization in Arab Countries: The activities of this project, being implemented in co-operation with FAO, AIDO (Arab Industrial Development Organization) and AFCFP (Arab Federation of Chemical Fertilizer Producers), comprise of Consultation meetings and seminars on topics relating to the development of fertilizer industries, technical issues, training, marketing and utilization of fertilizers.

UNIDO'S TECHNICAL ASSISTANCE PROGRAMME IN THE PESTICIDE SECTOR

a) Regional Network for the Production, Marketing and Control of Pesticides in Asia and the Pacific

The objective of the project is to assist Governments of developing countries in Asia in their efforts to expand availability of pesticides and to promote efficient and safe use of these agro-chemicals.

Nine member countries of the Regional Network maintain national co-ordinating units. Under guidance of the Regional Network Co-ordinator, these units act as focal points supporting execution of the programme which comprises four essential groups of activities:

- consulting services rendered mainly by experts available in Network member countries,
- training in the form of individual fellowships and study tours within and outside the region, and group training workshops,
- consultation meetings for exchange of experience among Network member countries,
- exchange of technical documentation and statistical data prepared by the National Network Co-ordinators and information systems.

Latin American countries have recently shown interest in establishing a similar regional network. Preparatory work is in progress.

b) Establishment of a Multipurpose Pesticide Pilot Plant in Egypt

The objective of the project is to assist the Egyptian Government in the development of an indigenous chemical pesticide industry. Formulation plants are already operating in the country. The project will assist in establishing manufacture of pesticide chemicals. The pilot plant envisaged in the project will be used for scaling-up of existing results of bench scale research on new types of pesticides developed in co-operation between the company and national research institutions.

The project also includes training of core technical personnel covering a variety of technical subjects such as engineering design of process plants, operation, pilot plant experimentation, quality control and safety aspects.

c) Establishment of a Pilot Plant for Pesticide Formulation in Burma

Under this project, assistance is being given to establish a small-scale pesticide formulation plant which would use locally available carrier materials and solvents for the production of a variety of formulations for which only the active chemical ingredients will have to be imported.

d) Pesticides Development Programme in India

The objective of this project is to assist India in accelerating and improving the development of the pesticide sector of India. The project covers a wide range of activities which include the following: Identification of local raw materials; Recommendation of most suitable pesticides to be manufactured locally; Development of new formulations and adaptation of imported technology; Standardization and quality control; Establishment of an information and documentation service; Preparations for up-dating and development of legislatory measures (Insecticides Act for Registration); Promotion of regional co-operation; Advisory services on connected issues (toxicology, pollution control, soil and food crop residues, etc.); Procurement of a pilot plant and laboratory equipment (analytical instrumentation).

e) Establishment of a Demonstration Plant in Cuba for Formulation of Pesticides

The activities of the project concentrate on technical assistance in selecting a proper site for the plant, making preparations for purchase of equipment, construction of the plant, start-up and training of staff.

f) Establishment of a Demonstration Plant in Malawi for Pesticide Formulation and Packaging

The project activities will include assistance in establishing a demonstration pesticide plant and training of local staff abroad.

g) Assistance to the National Pesticide Research and Development Centre in China

The first project included modernization and strengthening of the toxicological department of the Shenyang Research Institute of the Chemical Industry and production of toxicological data for registration of pesticides required by the Government. Expert services, training of national staff and provision of equipment were the major components of the project which was financed from a special purpose contribution to UNIDF. Supplementary means were made available by UNDP under a separate project with the objective of providing advisory assistance in the initial phase of operation of the programme both on organizational and technical matters.

The follow-up project is expected to assist the Institute in conducting research for the development of new chemical pesticide compounds and improving the production techniques of presently manufactured pesticides.

h) Strengthening of Research on Non-Toxic Pesticides in Hungary

The project supports a major central development programme of the Hungarian Government in the field of plant protection and development of pesticides.

The major share of costs of the project is borne by the Government while UNIDO's support activities concentrate on expert services (under sub-contract), fellowship training, study tours and missions of national project staff to attend international workshops and seminars, and procurement of specialized laboratory equipment.

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- Papers related to issue No.1	
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Second Draft of the UNIDO Model Form of Licensing and Engineering Services Agreement including Guidelines and Technical Annexures	UNIDO/PC.73
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- Paper related to issue No. 2

Programme to Strengthen Co-operation among Developing Countries in the Fertilizer Industry, Background paper	ID/WG.406/4

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Capital Cost Control of Fertilizer Plants in Developing Countries	UNIDO/IS.422

- Study related to issue No.4

Mini Fertilizer Plant Projects	UNIDO/IS.416

Information papers

- Papers related to issue No. 2

Report of the First Meeting of the Expert Group to Exchange Experiences in the Construction and Operation of Fertilizer Plants in the Developing Countries	UNIDO/PC.30
Draft Directory of Technological Capabilities in Developing Countries related to the Fertilizer Industry	

- Papers related to issue No. 3

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- Papers related to issue No. 4

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Draft Guide on Mini Fertilizer Plants	